

the Vessel; and in a natural State they shut that Passage, and so prevent the Blood from recoiling into the same, if it should endeavour to return. But in this case, by reason of its contracted Narrowness and Thickness, not being able to close or shut the Passage, the Blood flowd back again into the Cavity, which it had gradually enlarged, and dilated to the Bigness we see. Besides the *Muscular Valves* not being duly qualified for the Performance of their Office, the Blood recoiled into the *Auricle*, which it had distended in the like manner. This constant Regurgitation or Reflux of the Blood is besides sufficient of its self, to produce this extraordinary trembling or *παλμός καρδίας*, as the *Greeks* call it.

IV. *A ready Description and Quadrature of a Curve of the Third Order, resembling that commonly call'd the Foliate. Communicated by Mr. Abr. de Moivre, F. R. S.*

I Have look'd a little farther into that Curve which fell lately under my consideration. It is not the *Foliate* as I did at first imagine, but I believe it ought not to make a *Species* distinct from it. *AEB* (Fig. 1.) is the Curve I thus describe. Let *AB* and *BK* be perpendicular to each other. From the point *A* draw *AR* cutting *BK* in *R*, and make *RE = BR*, the point *E* belongs to the Curve Draw *BC* making an Angle of *45 grad.* with *AB*, this Line *BC* touches the Curve in *B*; from the point *E* draw *ED* perpendicular to *BC*, and calling *BD, x*; *DE, y*; *AB, a*; and making $\sqrt{8aa} = n$, the Equation belonging to that Curve is $x^3 + xxy + xyy + y^3 = nxy$ or $\frac{x^4 - y^4}{x - y} = nxy$ Taking *BG = AB*, and drawing *GP* perpendicular to *BG*, *PG* is an *Asymptote*. In the *Foliate*

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the Equation is $x^3 + y^3 = \frac{1}{2} n x y$, in which the two Terms $x x y$ & $x y y$ of the former Equation are wanting; and its *Asymptote* is distant from B by $\frac{1}{3} B A$. Again draw $E F$ perpendicular to $A B$: let $B F$ be called z and $F E$ v ; the Equation belonging to the Curve $A E B$ is $v v = \frac{a z z - z^3}{a + z}$. In the *Foliate* the Equation is $v v = \frac{a z z - z^3}{a + 3 z}$

From these two last Equations it seems that these Curves differ no more from one another than the *Circle* from the *Ellipsis*. I should be very glad to know your Opinion thereupon.

The Quadrature of the Curve here described has something of Simplicity with which I was well pleased. With the Radius $B A$ and Center B describe a Circle $A K G$, let the Square $H P S T$ circumscribe it, so that $H P$ be parallel to $A G$: prolong $F E$ till it meet the Circumference of the Circle in M , and through M draw $L M Q$ parallel to $H P$. The Area $B F E$ is equal to the Area $K H L M$, comprehended by $K H$, $H L$, $L M$ and the Arc $K M$. And the Area $B f e$ is equal to the Area $K m L H$ or $K M P Q$. Therefore if $B F$ and $B f$ are equal, the two Areas $B F E$, $B f e$ taken together are equal to the Rectangle $H Q$, and therefore the whole Space comprehended by $B E A X B e T G Z$ (supposing T and Z to be at an infinite Distance) is equal to the circumscribed Square $H S$.

N.B. This Quadrature is easily demonstrated from the Equation: for by it $a + z : a - z :: z z : v v$, that is $A F : E F :: M F : F B$, and so ϕF the Fluxion of $A F$ to L is the Fluxion of $M F$. Hence the Arcola $E F \phi e$ will be always equal to the Arcola $M L l \mu$, and therefore the Area $A E F$ always equal to the Area $M A L$.

Hence it appears that this Curve requires the Quadrature of the Circle to square it; whereas the *Foliate* is exactly quadrable, the whole Leaf thereof being but one third of the Square of $A B$, which in this is above three sevenths of the same. Again
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In our Curve, the greatest Breadth is when the Point F divides the Line AB in extreme and mean Proportion: whereas in the Foliate it is when AB is triple in power to BF. And the greatest EF or Ordinate in the Foliate is to that of our Curve nearly as 3 to 4, or exactly as $\sqrt{\frac{2}{3}} \sqrt{\frac{1}{3} - \frac{1}{3}}$ to $\sqrt{5 \sqrt{\frac{5}{4}} - 5 \frac{1}{2}}$.

But still these Differences are not enough to make them two distinct Species, they being both defined by a like Equation, if the Asymptote SGP be taken for the Diameter. And they are both comprehended under the fortieth Kind of the Curves of the third Order, as they stand enumerated by Sir Isaac Newton, in his incomparable Treatise on that Subject.

IV. *An easy Mechanical Way to divide the Nautical Meridian Line in Mercator's Projection; with an Account of the Relation of the same Meridian Line to the Curva Catenaria. By J. Perks, M. A.*

THE most useful Projection of the Spheric Surface of Earth and Sea for Navigation, is that commonly call'd *Mercator's*; tho' its true Nature and Construction is said to be first demonstrated by our Countryman Mr. *Wright*, in his *Correction of the Errors in Navigation*. In this Projection the Meridians are all parallel Lines, not divided equally, as in the common plain Chart (which is therefore erroneous,) but the Minutes and Degrees (or strictly, the *Fluxions of the Meridian*;) at every several Latitude are proportional to their respective *Secants*. Or a Degree in the projected Meridian at any Latitude, is to a Degree of Longitude in the Equator, as the *Secant* of the same Latitude is to *Radius*.

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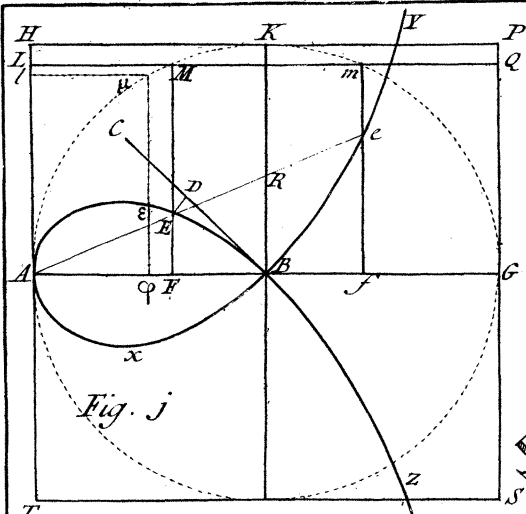


Fig. j.

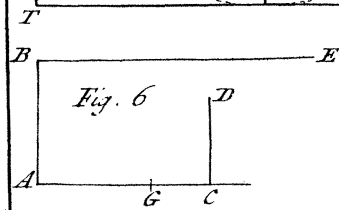


Fig. 6.

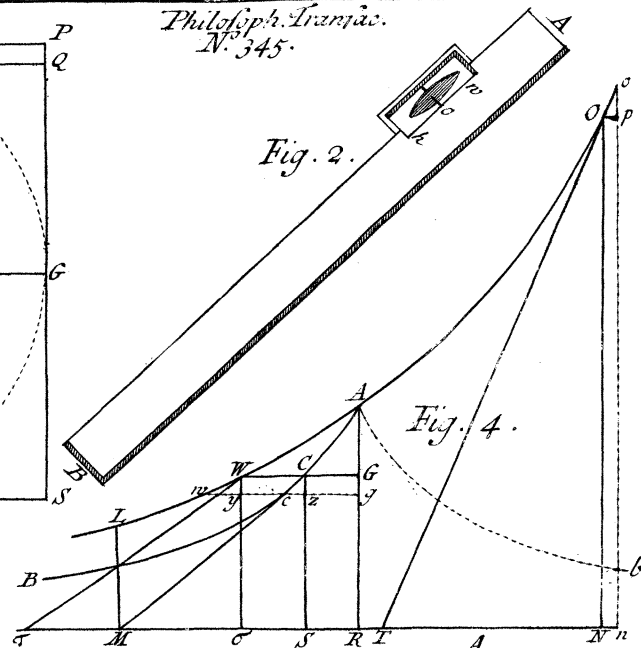


Fig. 2.

Fig. 4.

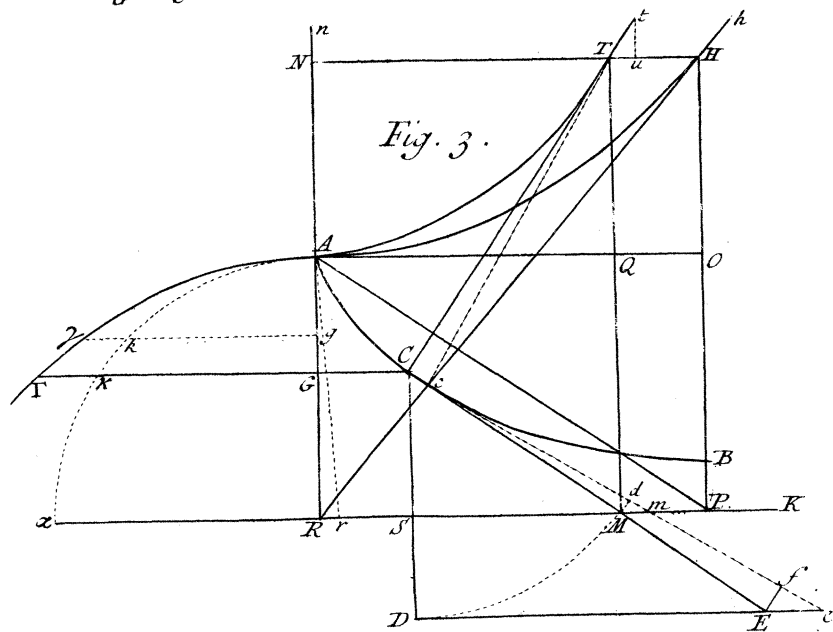


Fig. 3.

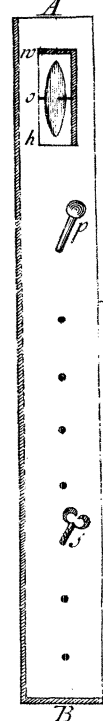


Fig. 5.